

Name: _____

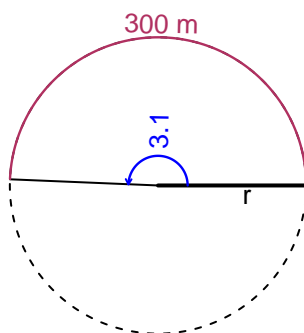
Date: _____

Trig Final (SLTN v639)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.1 radians. The arc length is 300 meters. How long is the radius in meters?

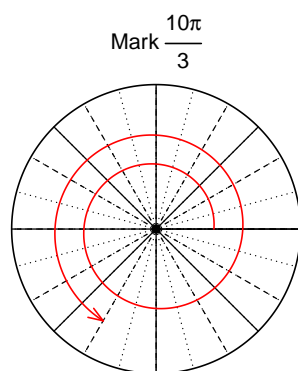


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 96.77$ meters.

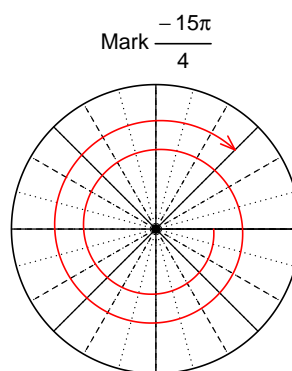
Question 2

Consider angles $\frac{10\pi}{3}$ and $-\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{10\pi}{3}\right)$ and $\cos\left(-\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(10\pi/3)$

$$\sin(10\pi/3) = -\frac{\sqrt{3}}{2}$$



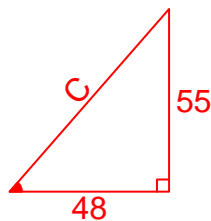
Find $\cos(-15\pi/4)$

$$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\tan(\theta) = \frac{55}{48}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

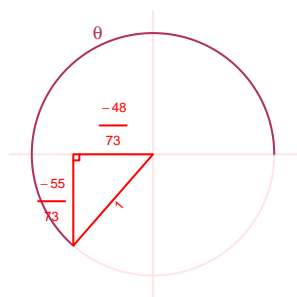
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}48^2 + 55^2 &= C^2 \\C &= \sqrt{48^2 + 55^2} \\C &= 73\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-55}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.95 Hz, an amplitude of 5.43 meters, and a midline at $y = -7.87$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.43 \cos(2\pi 2.95t) - 7.87$$

or

$$y = 5.43 \cos(5.9\pi t) - 7.87$$

or

$$y = 5.43 \cos(18.54t) - 7.87$$